

NEW RECORD OF ANTHRACOTHERIIDAE
(ARTIODACTYLA: MAMMALIA) FROM THE MIDDLE
EOCENE YEGUA FORMATION (CLAIBORNE GROUP),
HOUSTON COUNTY, TEXAS

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Abstract.—A small new species of the anthracotheriid artiodactyl genus *Heptacodon* is described from the middle Eocene Yegua Formation (Claiborne Group) from a site near Lovelady, Houston County, Texas. These specimens represent the first record of Eocene anthracotheres in Texas and are the southernmost and easternmost occurrence of the genus. The new species appears to be the most primitive of the four species of *Heptacodon* and provides an opportunity to emend the generic diagnosis of this exclusively North American taxon.

The remains of Eocene land mammals from the Gulf Coast Plain are exceedingly rare (see review in Westgate 2001). Although they are known from other formations within the middle Eocene Claiborne Group, land mammals have not previously been reported from the Yegua Formation. The purpose of this report is to describe an unusual, new occurrence of the anthracotheriid artiodactyl *Heptacodon* from the Yegua Formation in Houston County (100 miles north of the city of Houston and 100 miles east of Waco), Texas, and to focus new attention on this genus, the rarest among North American anthracotheriids.

Anthracotheriids are a family of extinct suiform, bunoselenodont artiodactyls that range in age from middle Eocene to Miocene and occurred throughout the Old World as well as in North America. *Heptacodon* is an exclusively North American genus that was first described from an isolated upper molar by Marsh (1894), and additional species were described by Troxell (1921) and Scott (1940), all from the White River Group of the northern Great Plains. MacDonald (1956) last reviewed the alpha taxonomy of the genus and recognized three species: *H. curtus* in the early Oligocene Upper Brule Formation, and *H. occidentalis* and *H. quadratus* from the late Eocene-early Oligocene Lower Brule Formation, although he admitted that the latter species might fall within the range of variation of the former. MacDonald also reported the first occurrences of the genus outside the White River Group, from the Chadron Formation in Wyoming and South Dakota,

further confirming the presence of the genus during the late Eocene.

More recently, yet earlier records of *Heptacodon* have appeared. Storer (1983) described a small species, *H. pellionis*, from the Lac Pelletier faunas of Saskatchewan which are placed within the late middle Eocene Duchesnean North American Land Mammal Age (NALMA) (Storer 1987; 1996). Fragmentary remains of *Heptacodon* have also been reported in the late middle Eocene (Duchesnean NALMA) Hancock Quarry fauna of the Clarno Formation in Oregon (Hanson 1996) and from the Duchesnean Claron Formation of central Utah (Eaton et al. 1999). Unfortunately, the fossils from Oregon or Utah are not adequate to diagnose to species. Thus, three previously-described species are recognized: the Whitneyan type species *H. curtus*; the Orellan *H. occidentalis*; and the Duchesnean *H. pellionus*. *Heptacodon quadratus*, as noted by MacDonald, appears to fall within the range of variation of *H. occidentalis*. Kron & Manning (1998) noted an undescribed *Heptacodon* from the Gulf Coast of Texas in their overview of North American anthracotheriid distribution, and this important record is described below. Material examined during the course of this study are deposited with the Frick Collection (F:AM) of the American Museum of Natural History (AMNH) in New York.

SYSTEMATIC PALEONTOLOGY

Order Artiodactyla

Family Anthracotheriidae

Genus *Heptacodon* Marsh 1894

Synonymies.—*Heptacodon* Marsh 1894, *Anthracotherium* Osborn & Wortman 1894, *Octacodon* Troxell 1921 (in part).

Type species.—*Heptacodon curtus* Marsh 1894.

Included species.—type, *H. occidentalis*, *H. pellionus*, *H. yeguaensis*, new species.

Occurrences.—Duchesnean of Saskatchewan, Oregon, Texas and Utah; Chadronian of Wyoming, South Dakota and Colorado; Orellan and Whitneyan of South Dakota.

Emended diagnosis.—*Heptacodon* differs from other Paleogene anthracotheriids in having a fused mandibular symphysis without trace of suture (unfused in most anthracotheriids), P/2 postprotocristid more buccally positioned and a slight central swelling along molar cristid

obliqua. Differs from the Asian genera *Anthracothema*, *Anthracokeryx*, *Siamotherium* and *Anthracosenex* in possessing a postentocristid, having a broken hypolophid and lacking an anterior protolophid. Differs from *Anthracokeryx*, North American *Bothriodon*, *Aepinacodon* and *Arretotherium*, and Euro-American *Elomeryx* and African *Bothriogenys* in possessing a strong postprotocristid, tooth rows without significant diastemata between canine and P/1 and/or P/1-P/2, relatively simple P/2-P/3 with posterior cingulid slight, P/4 only slightly elaborated by a strong protocristid and lacking posterior cingulid, premolar lingual cingula absent, molar paracristid ending near base of metaconid and unconnected to anterior cingulum, and molar postentocristid weak (*H. curtus*) to absent (other sp.). Further differs from *Elomeryx*, *Bothriodon*, *Aepinacodon* and *Arretotherium* in having a compressed (rather than open) mesostyle and lower crown height.

Heptacodon yeguaensis, new species

Figure 1b,c,f

Holotype.—F:AM 42984, left M2/ (Fig. 1c).

Paratype.—F:AM 42985, right M/3 (Fig. 1b and f).

Type Locality.—"Loc. 3, Lovelady, Houston County, Texas, Yegua Formation" (data from specimen tag).

Type Horizon.—stratigraphic position unknown, middle Eocene Yegua Formation, Claiborne Group.

Diagnosis.—Differs from all other *Heptacodon* (where known) in its smaller size and in having a moderately-developed mesiobuccal cingulum on the upper molar parastyle and relatively greater buccal projection of parastyle. Further differs from *H. curtus* and is similar to *H. occidentalis* and *H. pellionus* in retaining a relatively stronger hypolophid on the molars and having a weakly-developed preentocristid.

Description.—F:AM 42984, a left M2/ or possibly M3/, is a low-crowned five-cusped tooth (Figure 1c). It measures 15.1 mm in maximum length, 14.5 mm long at the midline and 19.8 mm in maximum width. Assignment as an M2/ is most likely. The metastyle is poorly developed. In most anthracotheriids the metastyle is at least moderately developed on M3/ in order to occlude with the posteriorly-extended M/3 hypoconulid (e.g., as in AMNH 1039, Fig. 1a). However, since a posterior wear facet is lacking on this tooth and M2/ and M3/ are not markedly different in size in known *Heptacodon* sp., it is

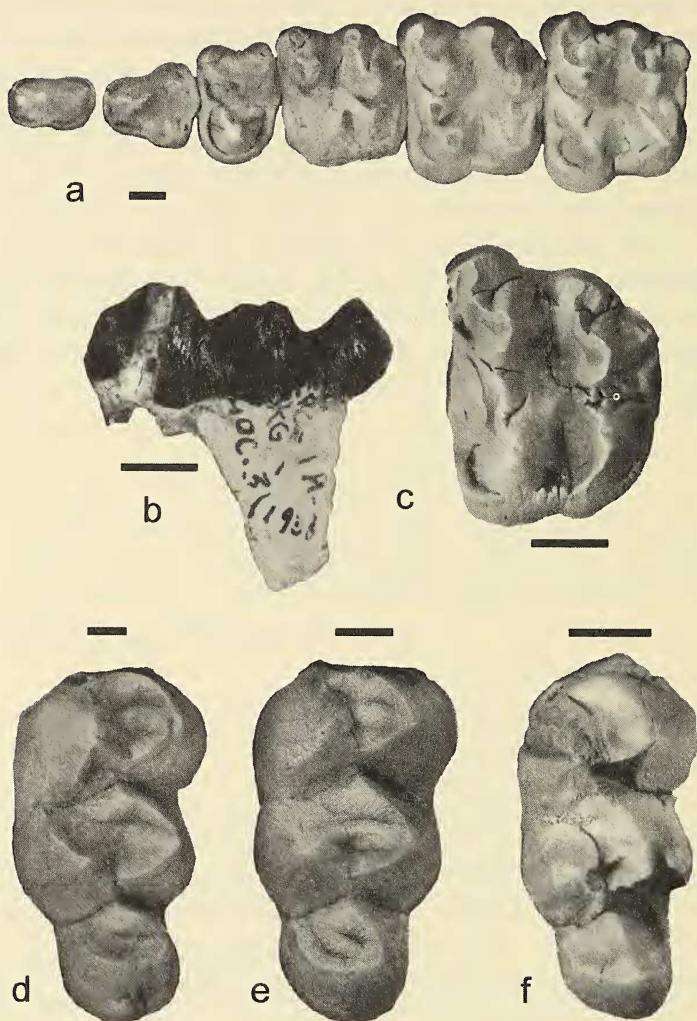


Figure 1. *Heptacodon* sp., shown to demonstrate differences among species of *Heptacodon*.

All specimens except 1b are shown coated with ammonium chloride, and all scale bars = 5 mm. (a) *H. occidentalis*, AMNH 1039, a left maxilla with P2/-M3/, from the Orellan Scenic Member of the Brule Formation, South Dakota; (b) *H. yeguaensis*, F:AM 42985, right M/3 in medial (lingual) view; (c) *H. yeguaensis*, F:AM 42984, left M2/; (d) *H. curtus*, F:AM 105170, right M/3, from Whitneyan Poleslide Member of the Brule Formation, South Dakota; (e) *H. occidentalis*, AMNH 1360, right M/3, from Orellan Scenic Member of the Brule Formation, South Dakota; (f) *H. yeguaensis*, F:AM 42985, right M/3 in occlusal view.

not possible to exclude the possibility that F:AM 42984 is an M3/ of this species. If so, *H. yeguaensis* would also be characterized by an unusually small M3/ metastyle.

The paracone and metacone are subequal in size with metacone positioned slightly toward the midline (lingual). Both cusps bear strong buccal ridges, better developed on the paracone than the metacone. The metastyle is tall, well-developed and cuspidate. It projects buccally beyond the bases of buccal cusps. The parastyle is larger, projecting buccally and distally with a slight crest atop it having a principally distal (rather than buccal) orientation. A moderately-developed cingulum is present on the buccal surface of the parastyle. This cingulum extends mesiad and sharply "ascends" to terminate near the occlusal surface. A well-developed and beaded (where unworn) anterior cingulum is present, extending lingually from near the midline and terminating near the base of the protocone. The protoconule is moderately developed and is approximately one-half the size of the major cusps. It is placed equidistant between the paracone and protocone. The metaconule is pyramidal in shape with a moderately developed premetacrista that is mesiolingually directed to join the slight lingual cingulum between protocone and metaconule. A posterior cingulum extends from the base of the metaconule to the base of the metacone.

Wear is strongest on the mesial faces of the cusps and crests, rendering the paraconule confluent with the protocone, and the postprotoconule crista is nearly obliterated. The buccally-oriented pre- and postmetaconule cristae are worn.

F:AM 42985, a right M3, is a five-cusped tooth (Figure 1b, f), measuring 21.7 mm in maximum length, 11.75 mm maximum width and with the hypoconulid alone measuring 6.65 mm in length and 7.33 mm in width, which is 18% shorter and 11% narrower than *Heptacodon pellionus*, the next smallest species of the genus. Enamel is missing on the posterior face of the protoconid and mesiobuccal corner of the protoconid, and the posterior half of the hypoconid is missing. The trigonid is formed by subequal protoconid and metaconid with the protoconid slightly mesiad of the metaconid. The paracristid is strong, descending the face of the paraconid in a shallow arc, terminating near the middle of the metaconid's base and a few millimeters above the slight anterior cingulum. The metaconid and protoconid are joined by a moderately straight protolophid, and there is a strong postmetacristid.

The trigonid is slightly wider than the talonid. The cristid obliqua is strong and high, taking a sinuous course across the talonid basin to ascend the posterior trigonid wall just lingual of the midline. A slight swelling is present near the center of the crest. The entoconid and hypoconid are joined by a V-shaped posterior hypocristid and posterior entocristid. The hypolophid is discontinuous and is better developed in its buccal half. The "heel" of M/3 is formed by a well-developed hypoconulid. The "loop" begins at the midline and terminates just posterior to the entoconid's base, leaving the hypoconulid basin lingually open. Very slight buccal cingulids are present between hypoconulid and hypoconid and between hypoconid and protoconid.

Compared with *Heptacodon curtus* (Figure 1d) and *H. occidentalis*. (Figure 1e), the M/3 is relatively narrower with respect to length, and the crests are more weakly developed. In most respects, the M/3 of *H. yeguaensis* appears to be a scaled-down version of its much larger relatives. However, like *H. occidentalis* and *H. pellionus* (not figured) it still retains a hypolophid, which is largely lost in *H. curtus*, and has a weak preentocristid, which is strongly developed in *H. curtus*.

Etymology.—This species is named for the Yegua Formation from which it was collected.

DISCUSSION

Although poorly known, *Heptacodon yeguaensis* appears to be the most primitive of the known species of *Heptacodon*. The retention of a lingual portion of the hypolophid on M/3, a lower molar preentocristid, and a buccal cingulum on the upper molar are primitive features that are shared with other, earlier Paleogene anthracotheriids. These features are also more primitive than the condition observed in *Heptacodon* specimens from known Duchesnean and Chadronian sites (where comparable).

This record is the first for this genus in the southern United States as well as its easternmost occurrence. This species may also represent the oldest occurrence of the genus in North America, but its precise relative age is difficult to determine for several reasons. The Yegua Formation is well constrained through micropaleontological analyses to approximately two million years of the late middle Eocene, spanning the entirety of planktonic foraminiferal zone P14 and part of P15 (Meckel and Galloway 1996). Based on correlation of these zones to the

Geomagnetic Reversal Time Scale (Aubry et al. 1988), these zones correspond to Chrons 18n and the lower part of Chron 17r. Based on the latest attempts to determine the placement of the Uintan-Duchesnean boundary (Prothero 1996; Prothero et al. 1996), the interval spanned by the Yegua Formation would correspond to the latest Uintan and much of the Duchesnean. However, the precise stratigraphic position of the type locality within this formation has not yet been determined. The type and referred specimen were collected in 1936 by Claude Riley from a site near Lovelady, Houston County, Texas, but its precise location and stratigraphic position within the formation is not known. Other fossils collected with the mammal teeth include a dermatemydid turtle and an ariid catfish, which do not provide any additional evidence for the age of the locality. This limited evidence, combined with the Duchesnean age of faunas from the overlying Jackson Group, is suggestive of an early Duchesnean age assignment for the Lovelady fossils. However, an older or slightly younger age cannot be eliminated on available evidence.

Heptacodon yeguaensis also provides a frustratingly incomplete addition to the knowledge of Eocene mammals on the Gulf Coastal Plain. As recently reviewed by Westgate (1986; 1990; 2001) the knowledge of Eocene mammal evolution on the Gulf Coast Plain is principally from the Uintan Casa Blanca local fauna of Texas. The remainder of sites and faunas, like that described here from near Lovelady, represent only isolated occurrences, hinting at the tropical faunas that once thrived along the ancient Texas shore.

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